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AD-P004 177	Birds and Aviation.
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AD-P004 195	Reducing Guil Use of Some Attractions Near Airports.
AD-P004 196	(Federal Aviation Administration) Policy Regarding Solid Waste Disposal Facilities.

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AD#:	TITLE:
AD-P004 197	Airport Bird Hazards Associated with Solid Waste Disposal Facilities.
AD-P004 198	Successful Control of Guils and other Birds at a Sanitary Landfill.
AD-P004 199	Effectiveness of an Overhead Wire Barrier in Deterring Guils from Feeding at a Sanitary Landfill.
AD-P004 200	Effectiveness of an Overhead Wire Barrier System in Reducing Guil Use at the BFI Jedburg Sanitary Landfill, Berkeley and Dorchester Counties, South Carolina.
AD-P004 201	Evaluation of Effectiveness of Bird-Scaring Operations at a Sanitary Landfill Near CFB Trenton, Ontario, Canada.
AD-P004 202	Development of Bird Hazard Reduction for Airport Operational Safety.
AD-P004 203	The Bird Strike Situation and Its Ecological Background in the Copenhagen Airport, Kastrup.
AD-P004 204	Bird Control Program, Orlando International Airport.
AD-P004 205	Staff Assistance to Bases for Bird Hazards.
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1983 AIR FORCE BIRD STRIKES

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ABSTRACT

Since 1975, the Air Force Bird/Aircraft Strike Hazard (BASH) Team, located at Tyndall AFB FL, has been responsible for maintaining all Air Force bird/aircraft strike data. Information for 1983 has been compiled and trends determined in order to better define the extent of the bird/aircraft strike hazard potential. During the 1983 reporting period, there were over 2300 reported bird strikes costing more than $4 million. In addition, one major and several minor personnel injuries resulted from windshield/canopy penetrations by birds. This presentation identifies trends in the Air Forces' bird strike occurrences and emphasizes the continual need for reporting all bird strikes.

INTRODUCTION

Since 1975, the Bird/Aircraft Strike Hazard (BASH) Team, located at Tyndall Air Force Base, Florida, has been responsible for maintaining all Air Force bird/aircraft strike data. The data base contains information as far back as the early 1960's; unfortunately, that data is fairly sketchy. One of the reasons for the lack of detailed information was the change of reporting criteria over the years. Only within the last few years have all Air Force bird strikes been reported. As aircrew members no doubt know, pilots coming home after a long flight, perhaps to include a low-level flying mission, have a hard time finding the energy to fill out one more report on a bird strike that did little or no damage to their aircraft. The crew chief of the aircraft wipes off the evidence and everyone presses on with the mission. However, this is not always the case, in that many aircrews realize the importance of reporting all bird strikes and do so according to the regulation.

The BASH Team has suggested many ideas to increase BASH awareness of all personnel involved with the bird strike problem. Air Force Regulation 127-15 requires that all bird strikes--those that cause $1,000 or more in damage, as well as those that don't--be included in the overall statistics to properly define the problem. Only when all bird strikes are reported and analyzed can we view the true nature of the hazards birds cause to our aircraft.

From 1980-1982 the BASH Team recorded over 3900 bird strikes to Air Force aircraft. In 1983 over 2,300 strikes were reported. Either the Air Force is hitting more birds each year, more organizations are reporting bird strikes, or both. We believe that because of the increased emphasis on the

importance of reporting strikes, more bird strikes are being reported. Likewise, with increased low-level flying, we do expose our aircraft to environments in which more birds are found. Thus, we could also be seeing an actual increase in the bird strike rate. Unfortunately, at this time, critical information is not available in order to perform a proper quantitative analysis.

BIRD STRIKES BY IMPACT POINT

TABLE 1

Percent of Bird Strikes by Impact Point

Impact Point	Percent
Engine/Engine Cowling	22.3
Windshield/Canopy	20.6
Wings	19.3
Radome/Nose	15.1
Fuselage	8.9
External tanks/pods/gear	6.7
Multiple hits	5.2
Other	1.9

Table 1 shows all areas of the aircraft are potentially vulnerable to birds. Of course, where a bird strikes the plane is a matter of chance unless the pilot is able to see the bird and maneuver the aircraft in such a way that the bird perhaps strikes the underside of the wing or radome. Normally, engine and windshield strikes pose the greatest damage and are the greatest threat for a crash or fatality. In reality, five percent of the windshield/canopy strikes resulted in birds penetrating the canopy, but only a few cases occurred where minor injuries resulted. Fortunately, in 1983, the Air Force did not lose any aircraft or aircrew due to bird strikes; however, total cost in damage was on the order of $4 million.

TIME OF BIRD STRIKE OCCURRENCE

Most bird strikes occurred during the day (67%), but a large number occurred at night (18%). Only 5% of the bird strikes occurred during the twilight hours. Since most of our flying is during the daylight hours, these statistics are not surprising. Unfortunately, we do not calculate a bird strike rate for day and night flying since it is difficult, time consuming, and expensive to obtain exact flight times per hour of the day. We do know, however, that birds are most active in early morning and late afternoon hours and that many bases we visit restrict flying during these times. Some bases restrict takeoffs and landings for an hour or more during dawn and dusk to reduce the chance of a bird strike.

Bird strikes occurred during all months of the year; however there were times of increased strikes. This increase coincides with the times of migration for birds. As seen in Figure 1, the number of bird strikes peak

in the spring when birds are migrating north to breed; however, we observe a much higher peak in the fall when adult birds and their offspring are making the journey south for the winter. Since most birds begin their migratory flights shortly after dusk, the number of night strikes greatly increase while the number of day strikes only moderately increase.

By understanding the reasons why bird strikes increase during certain times of the day and year, we can assist aircrews in avoiding these higher risk times. We ensure that our bird strike awareness programs receive emphasis before the fall and spring migration periods by sending out messages that give pilots a "heads up." When bird activity increases in the early morning, the director of operations, at a base experiencing bird strikes, may delay takeoffs which could prove to be very prudent.

WHERE BIRD STRIKES OCCUR

Figure 2 shows almost half of the bird strikes occurred within the traffic pattern of our bases (e.g., takeoff, landing, approach). Obviously, by reducing the number of birds attracted to an airfield, we can effectively reduce the risk of bird strikes. Therefore, airfield environments receive the greatest emphasis in attempting to reduce the occurrence of strikes. Also, by increasing traffic pattern altitudes, we can reduce the chance of a bird strike in the majority of the environments flown.

The second most vulnerable phase of flight, with respect to hitting birds, is during low-level operations. High speed, (350-500 knots) low-level (1000-500 feet above ground level (AGL)) routes traverse the country in rural, sparcely populated areas, many of which are near wildlife refuges and reserves. Almost 25% of all strikes occurred in this flying environment. Since windshield/canopy penetrations by birds are more likely to occur while flying at these speeds, especially for our fighter aircraft, the risk of aircraft/aircrew loss is greater during low-level operations. As seen in Figure 3, most bird strikes occurred at or below 500 feet AGL. Should a bird penetrate the canopy, pilots have little time to react due to sudden loss of vision, possible lack of aircraft control and loss of engine thrust or some other severe circumstance at these low altitudes and high airspeeds. We recommend pilots increase low-level flight altitudes and reduce airspeeds when operationally feasible.

TYPES OF BIRDS ENCOUNTERED

The BASH Team has an ongoing program to identify bird remains as a result of bird strikes. Air Force Safety Officers send feathers and other nonfleshy remains to the BASH Team for identification. Of the 2300 strikes, approximately 26% are placed in a "bird-type" category (e.g., shorebirds, gulls). Without remains, another 22% are placed in a "small, medium, or large bird" category, depending on pilot observations. The remaining 52% are unknown as far as the type or size of bird impacting the aircraft.

TABLE 2

Types of Birds Involved in Bird/Aircraft Strikes
1983

Bird Type	Number of Strikes
Starlings	39
Shorebirds	17
Blackbirds	22
Horned Larks	27
Meadow Larks	29
Doves	41
Pigeons	19
Gulls	122
Egrets and Herons	21
Vultures	46
Hawks, Falcons and Eagles	126
Ducks	52
Geese	10
Unidentified Birds	
Small Birds	406
Medium Birds	38
Large Birds	50

By knowing the "bird-type" causing the problem, the BASH Team and other experts can more specifically channel their suggestions. For example, should the identified "bird-type" be a duck, there is less need to spray a pesticide for insectivorous birds than there is to look for a source of water to attract waterfowl. Raptors (vultures and hawks) and gulls continue to give military flying the most problems; because of their large size, they also pose our biggest threat.

AIRCRAFT BIRD STRIKE RATES

The wide variety of aircraft flown by the Air Force and the missions they perform, create large differences between the bird/aircraft strike rates for specific aircraft. As seen in Figure 4, fighter aircraft experience the most strikes. This is due, in part, to fighters flying more hours, as well as flying more within the 500 feet AGL and below vulnerability area. But, bombers and cargo aircraft also have a substantial low-level flying mission and experience 7.9% and 28.4% of the bird strikes, respectively. Trainers also receive a large amount of strikes with 19.1%. By analyzing bird strike rates, we can provide information to aircraft designers so they can create a less vulnerable aircraft with respect to bird damage. Probably, the most well known of these programs is the aerospace transparency tests done by the Wright Aeronautical Laboratory at Wright-

Patterson AFB OH. By their efforts, incidents of windshield penetrations by birds have been reduced. This has saved the Air Force millions of dollars in potential damage as well as aircrew's lives.

CONCLUSION

By continuing to collect and maintain bird strike data, the Air Force has been able to channel its efforts toward reducing the risk of bird strikes to specific areas. Since we know the "bird-types" most frequently hit, when bird strikes most frequently occur, and under what conditions they occur, we can more effectively minimize the hazards caused by birds. Since types of aircraft change, mission profiles change, environments are altered, and personnel concerned with the bird strike hazard continue to move from base to base at approximately three year intervals, the need for collecting and maintaining bird strike data will be ever present.

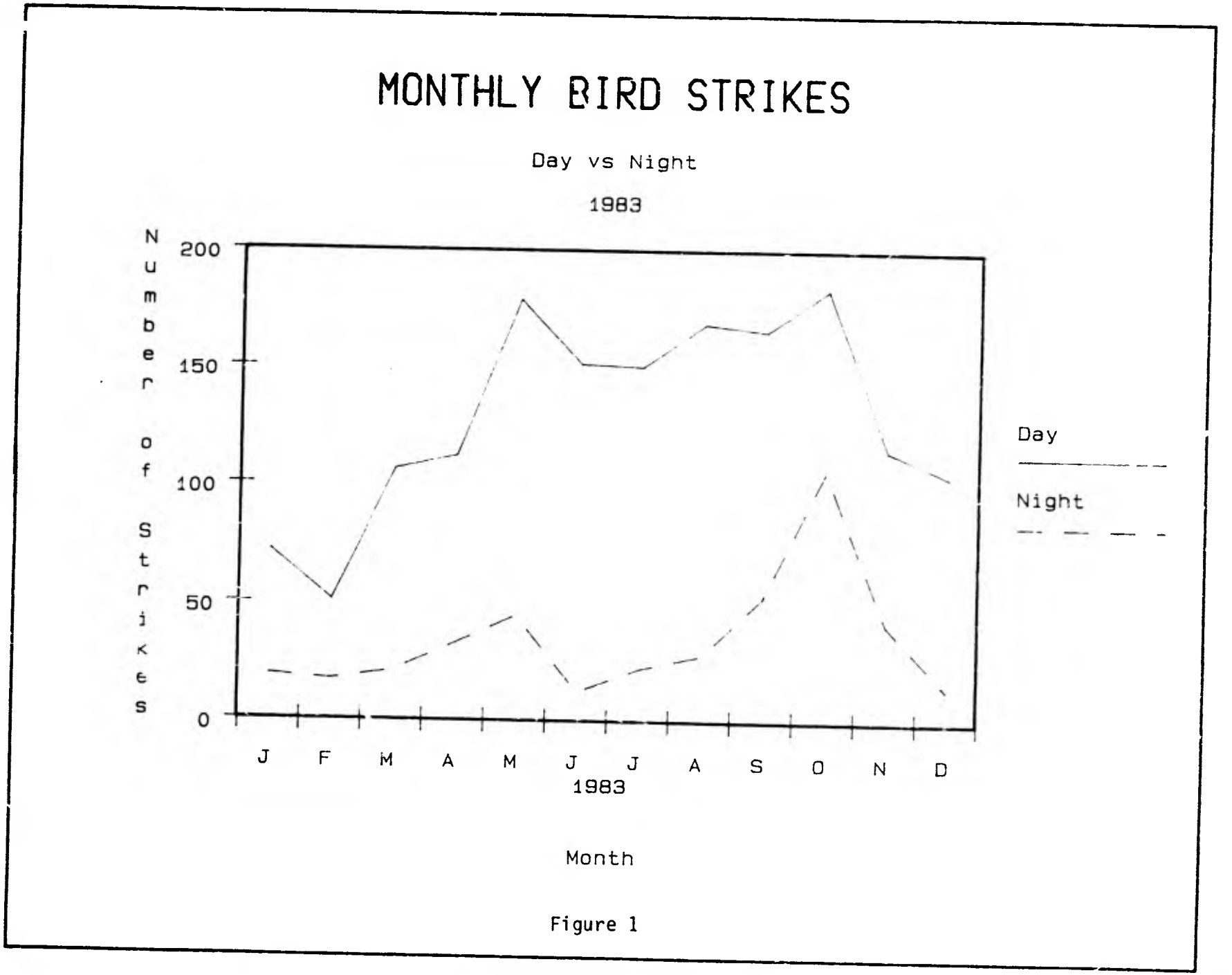
MONTHLY BIRD STRIKES
Day vs Night
1983
Number of Strikes
200
150
100
50
0
J F M A M J J A S O N D
1983
Month
Day
Night

Figure 1

BIRD STRIKES BY PHASE OF FLIGHT

1983

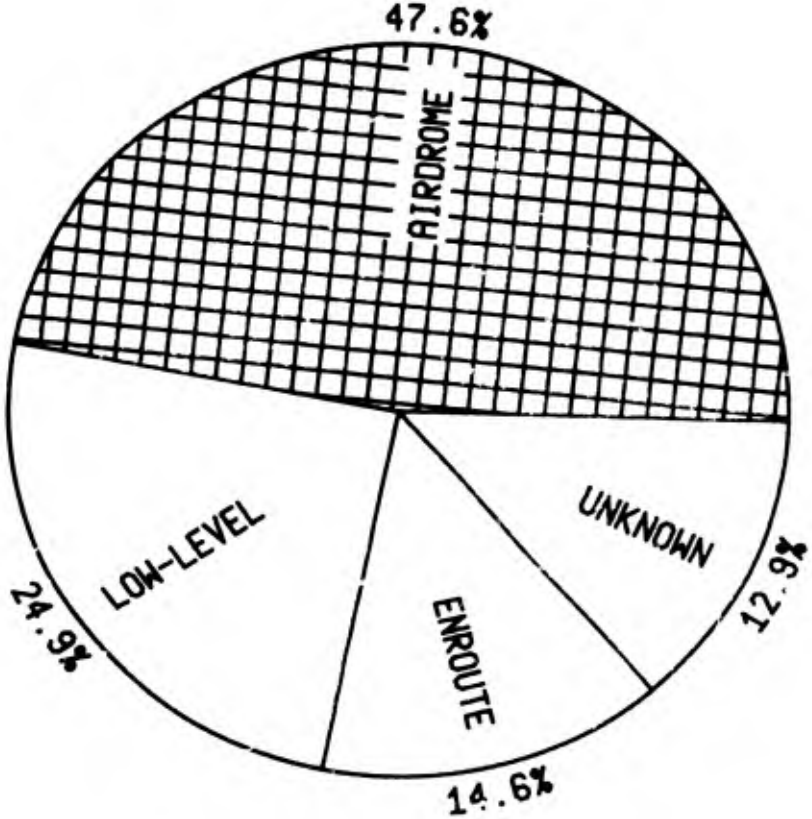

Figure 2

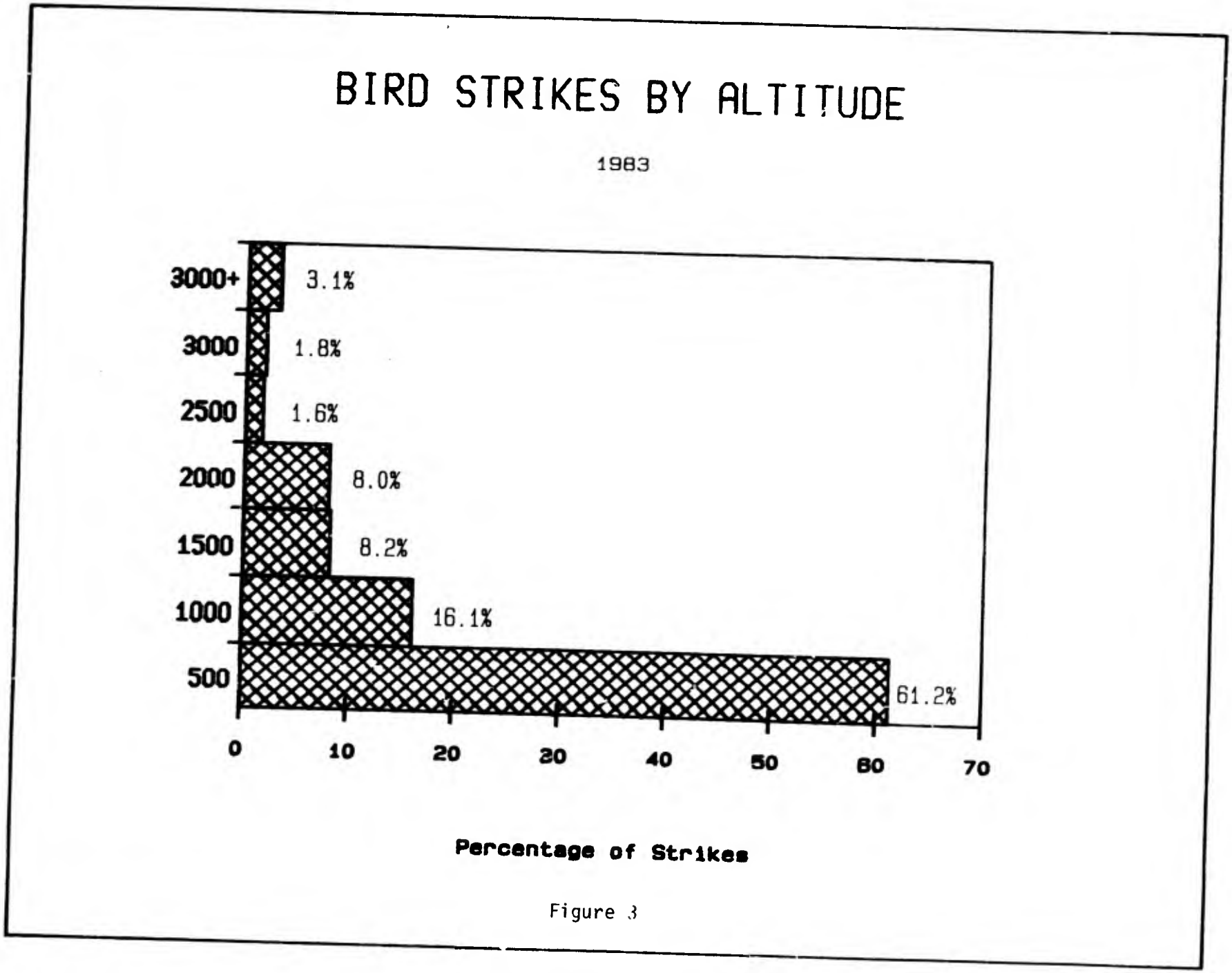
BIRD STRIKES BY ALTITUDE
1983
3000+
3000
2500
2000
1500
1000
500
3.1%
1.8%
1.6%
8.0%
8.2%
16.1%
61.2%
0
10
20
30
40
50
60
70
Percentage of Strikes

Figure 3

BIRD STRIKES BY AIRCRAFT GROUP

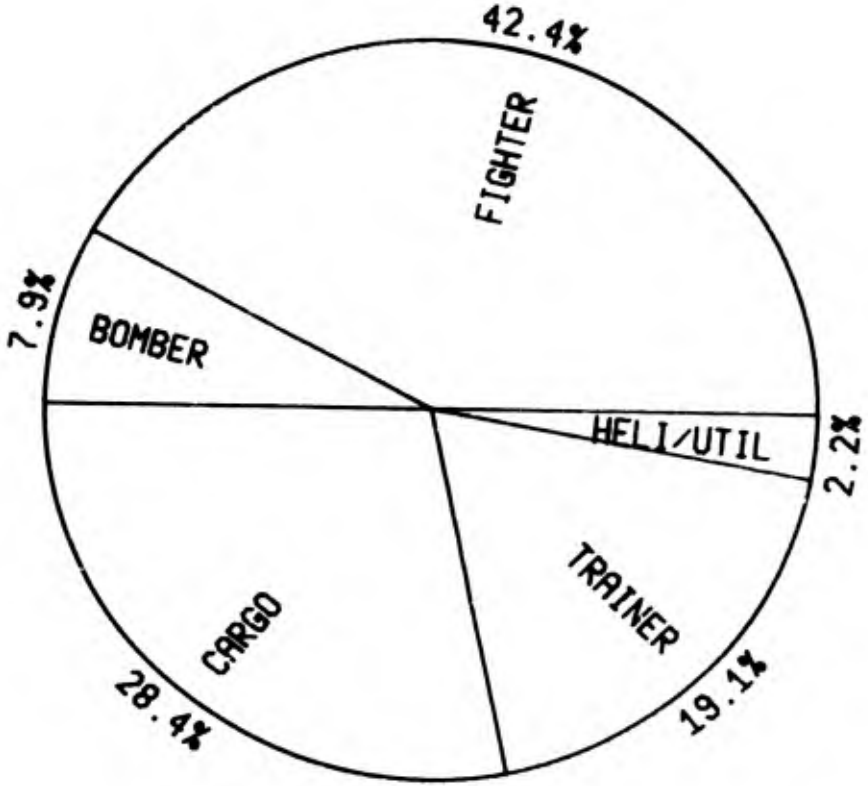

Figure 4